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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Environmental and Energy Policy Statement

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Policy Statement.

SUMMARY: This is a statement affirming the FAA's environmental and energy policy for U.S. civil aviation. This policy statement outlines guiding principles, establishes initial high level performance goals, and describes strategies to achieve the goals.

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SUPPLEMENTARY INFORMATION:

Policy Statement:

Introduction

This policy statement affirms environmental and energy policy for U.S. civil aviation. The Next Generation Air Transportation System, commonly called NextGen, is the transformation of the U.S. aviation system by employing technological, operational, and infrastructure advances to provide improved safety, security, mobility, environmental performance, and quality of service.[1] The overarching environmental performance goal for NextGen is environmental protection that allows sustained[2] aviation growth.[3]

The primary environmental and energy issues that significantly influence the capacity and flexibility of the national aviation system are aircraft noise, air quality, climate, energy, and water quality. These issues are being addressed under a range of environmental laws and regulations, and by governmental and industry initiatives. Major strides in lessening the environmental effects of aviation have been made over the past several decades. However, aircraft noise continues to be the public's primary objection to near term aviation growth. Aircraft emissions contribute to air quality-related health effects, as do emissions from all combustion processes, and are causing heightened concerns locally and globally. The potential effects of aircraft emissions on the climate of our planet may pose the most serious long term environmental consequences facing aviation. Noise and emissions will be the principal environmental constraints on the capacity and flexibility of the national aviation system unless they are effectively managed and mitigated. It is important to build on current efforts and develop new strategies as the system is transformed with NextGen. In addition, energy supply, its cost, and the relationship between the burning of fossil fuels and climate change are driving increased emphasis on the need for energy conservation and sustainable alternative fuels. Finally, the nation's water quality requires continued protection from potential contamination from airport-related discharges.

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[1] See Public Law 108–176, title VII, § 709, Dec. 12, 2003, 117 Stat. 2582,
[2] Sustainability means developing aviation in a manner that enhances and promotes the Nation's economic, environmental, and social initiatives.
[3] See the NextGen Integrated Plan (December 2004) Sections 5.1.6 and 7.6.

These combined environmental and energy challenges must be successfully managed and mitigated for NextGen to realize its full potential and for the U.S. to meet the aviation transportation needs of the 21st century.

Environmental and Energy Policy Framework and Principles

This policy statement outlines guiding principles, establishes initial high level performance goals, and describes strategies to achieve the goals. The main guiding principles are 1) to limit and reduce future aviation environmental impacts to levels that protect public health and welfare and 2) to ensure energy availability and sustainability.

Two supporting principles are:

1) Appropriate environmental protection measures combined with effective and efficient environmental reviews must be an integral part of strategies for future growth in air transportation. The implementation of a strategic Environmental Management System (EMS) approach should provide a foundation for improving the integration of environmental and energy assessment and performance into the planning, decision-making, and operation of the national aviation system.[4] The NextGen EMS approach, featuring collaboration across stakeholders, is a strategic concept that requires development, maturation and a robust implementation plan.

2) Aviation must have reliable and sustainable sources of energy and must use that energy efficiently and in a manner that is consistent with environmental protection.

[4] http://www.jpdo.gov/library/20101123_JPDOPaper_EMS_Strategy_v3.0.pdf

Continuing progress in energy efficiency and pioneering advances in sustainable alternative aviation fuels will be key components of NextGen.

Based on these guiding principles, this policy statement is intended to be a living document. The initial high level goals presented below will serve as the guide for setting of specific quantitative performance targets. We will periodically review the goals, targets, and strategies to achieve them and refine them over time based on better scientific knowledge, changing environmental protection and energy needs, and improved technological and operational capabilities. They are additionally subject to review and revision based on Administration policy guidance, particularly with respect to energy, climate, and sustainability. New goals, targets, and strategies may be defined based on these same factors.

Key Aviation Environmental and Energy Goals

Each of the following initial goals is presented by impact area – noise, air quality, climate, energy, and water quality. These goals are established at levels intended to reduce future aviation environmental and energy impacts sufficiently to protect public health and welfare while allowing sustained air transportation growth. They are high level goals at the aviation system-wide level, and are intended to be common to all individual organizational EMSs.

Each goal will have quantitative targets that are actionable and can be used to measure progress. Initial targets, some of which have been established, will be based upon currently available scientific knowledge of aviation's impacts and will take into account near term operational and technological improvements.

Noise Goal: Reduce the number of people exposed to significant noise around U.S. airports in absolute terms, notwithstanding aviation growth, and provide additional measures to protect public health and welfare and our national resources.[5]

The number of people in the U.S. exposed to significant aircraft noise since 1975 has dropped by 90 percent, an impressive reduction primarily due to reductions in aircraft source noise and phase outs of Stage 1 and 2 aircraft over 75,000 pounds. Yet noise remains a predominant aviation environmental concern of the public, one of the principal environmental obstacles to expanding airport and airspace capacity, and the one that has used the most mitigation resources—including funding from the Airport Improvement Program (AIP) and Passenger Facility Charges (PFC). The persistence of significant levels of aircraft noise in communities around airports is the major impact, but not the only one. There are increasing concerns in areas of moderate noise exposure and public complaints from suburban and rural areas where ambient noise is lower. At noise exposure levels below those involving health and welfare concerns, there are also sensitivities with respect to national resources such as national parks. While techniques and tools for measuring and modeling noise exposure provide a reliable means of assessing the levels of aircraft noise to which people are exposed, focused research could improve our scientific knowledge base of the extent of impacts and appropriate mitigation below historically-defined significant noise levels.

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[5] See the 2004 FAA Report to Congress on Aviation and Environment at www.faa.gov/library/reports/media/congrept_aviation_envirn.pdf;

Air Quality Goal: Achieve an absolute reduction of significant air quality health and welfare impacts attributable to aviation, notwithstanding aviation growth.[6]

Aviation's impact on air quality, through emissions of specific pollutants, is a growing concern[7]. Emissions of criteria pollutants[8] contribute to surface air quality deterioration, resulting in human health and welfare impacts[9]. The focus for commercial aviation and airport infrastructure is on reducing emissions of nitrogen oxides (NOx), particulate matter (PM), sulfur dioxide (SO2), and hydrocarbons (HC). Lead (Pb) is an issue for general aviation since more than 200,000 piston-engine aircraft rely on leaded AvGas for safe operation and produce about half of all lead emissions in the U.S. At the airport level, about 30 percent of U.S. commercial service airports are in non-attainment areas that do not meet national air quality standards or in maintenance areas. For these airports, emissions issues add to the complexity and uncertainty of expansion proposals. An increasing number of airports have invested in low emission vehicular fleets and ground support equipment to reduce emissions. The national air quality standards are expected to become more stringent in the future, placing more pressure on aviation to reduce emissions despite growth.

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[6] See the 2004 FAA Report to Congress on Aviation and Environment at www.faa.gov/library/reports/media/congrept_aviation_envirn.pdf

[7] See 2009 Partnership for AiR Transportation Noise and Emissions Reduction (PARTNER) Center of Excellence (COE) Report titled Aircraft Impacts on Local and Regional Air Quality in the United States at http://web.mit.edu/aeroastro/partner/reports/proj15/proj15finalreport.pdf.

[8] There are six criteria pollutants identified in the Clean Air Act: Ozone; Lead; Nitrogen Oxides; Carbon Monoxide; Sulfur Dioxide; and Particulate Matter.

[9] Includes health impacts such as increased risks of mortality or morbidity as well as impacts that influence psychological well-being and happiness.

Climate Goal: Limit the impact of aircraft CO_2 emissions on the global climate by achieving carbon neutral growth[10] by 2020 compared to 2005, and net reductions of the climate impact from all aviation emissions over the longer term (by 2050).[11]

The potential effects of aircraft emissions on the global climate may be the most serious long-term environmental and energy issues facing aviation. Aircraft account for about 3 percent of both national and worldwide carbon dioxide (CO_2) emissions. Aircraft have been projected to contribute a larger portion of greenhouse gas emissions in the future – perhaps 5 percent by 2050 – based on projected aviation growth assumptions and the prospect of easier transition to alternative technologies and fuels for land transport modes.[12] There are additional concerns specific to aircraft as the majority of emissions from a given flight are directly released into the chemically complex and sensitive region of the upper troposphere and lower stratosphere. While CO_2—accounting for the bulk of aviation greenhouse gas emissions—has the same effects regardless of where it is emitted, certain emissions may have greater effects when released at altitude. In addition, aircraft emissions of water vapor and aerosols lead to the formation of contrails and modification of cirrus cloud distribution, both of which can impact earth's climate. There is not yet sufficient scientific knowledge about aircraft contrails to determine their impact on climate or to adopt measures to deal with them. There are multiple, interrelated

[10] Carbon neutral growth is no higher carbon dioxide emissions in 2020 than is reported in 2005.
[11] Goal unveiled by U.S. at COP/15 and documented in Canada, Mexico, U.S. Position presented at ICAO's 37th Assembly. See Working Paper titled A More Ambitious, Collective Approach to International Aviation Greenhouse Gas Emissions, Section 2.3.
[12] See Intergovernmental Panel on Climate Change Fourth Assessment Report, "Working Group 1: The Physical Science Basis," 2007.

impacts due to aircraft emissions with varying degrees of understanding, with CO_2 being the best understood and quantified.

Energy Goal: Improve National Airspace System (NAS) energy efficiency by at least two percent per year, and develop and deploy alternative jet fuels for commercial aviation.[13]

Aircraft engine and airframe advances, together with improved air traffic management and operating procedures, have dramatically improved aircraft fuel efficiency. The aircraft energy efficiency improvement over the last 20 years has outpaced other forms of transportation in the U.S. Notwithstanding this success, there is renewed emphasis on improving the fuel efficiency of the aviation system. Fuel currently represents the largest operating cost for U.S. airlines, and this cost category has grown dramatically in recent years. The air traffic modernization planned under NextGen should further improve efficiency by reducing delays and enabling more direct routings. Sustainable practices by airport operators can conserve energy, make use of renewable resources (solar, wind, geothermal), and deploy low emission vehicles and ground support equipment.

Moreover, advances in the development of sustainable alternative fuels offer great promise for emissions reduction. Nearly 100 percent of the fuel used in aviation operations is petroleum based—raising issues of energy supply, energy security, and fossil fuel emissions affecting air quality and climate. In response to these multiple concerns, government and the aviation industry have a strong interest in "drop in"

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[13] See ICAO Assembly Resolution A37-19: Consolidated statement of Continuing ICAO policies and practices related to environmental protection – Climate change, Section 23.g).

alternative aviation fuels that can be blended with or replace petroleum jet fuel with no changes to existing engines, aircraft, ground infrastructure, and supply equipment. Alternative fuel options that use plant oils, sugars, or cellulose from plants have the potential to dramatically reduce CO_2 emissions, if produced in a sustainable manner. Generally, all alternative aviation fuel options appear to reduce particulate matter emissions in engine exhausts—a cause of respiratory ailments, although not unique to aviation as a source.

Water Quality Goal: Limit the adverse aviation discharges to U.S. waters and reduce aviation's contribution to significant water quality impacts.[14]

Many U.S. airports are located near waterways and wetlands because, when airports were originally built, the best available land suitable for an airport (flat and inexpensive) was often found near water. As a result, aviation has the potential to adversely affect surface water and groundwater biologically, chemically, and physically. Runoff containing sediments, fluids, fuel, construction materials, and other waste products can cause adverse water quality and biotic community impacts during airport construction. Apart from construction, an airport's storm water discharges, aircraft and pavement deicing activities, and aircraft fueling and maintenance procedures can contribute further to water quality impacts. As an example, biological and chemical breakdown of deicing chemicals in airport runoff can cause severe dissolved oxygen demands on receiving waters. Additives in deicing chemicals may be toxic to aquatic life. The Nation's water

[14] This goal is consistent with Sections 401, 402, and 404 of the Federal Pollution Control Act of 1972, as amended (now the Clean Water Act) and the National Environmental Policy Act (NEPA) of 1969.

quality is controlled by legislation and regulations, permit programs, spill control prevention planning, and best management practices. It is important for aviation to continue efforts to minimize discharges that adversely affect water quality.

Aviation Environmental and Energy Strategies

The environmental and energy challenges confronting aviation are not amenable to a single solution; rather, they will require multiple solutions involving innovations in technology, operations, planning, and sustainability. A five-pillar comprehensive and integrated approach to achieving aviation environmental and energy goals, based on aviation's traditional strengths of technological and operational innovation, is outlined below with examples provided under each strategy.

Improved Scientific Knowledge and Integrated Modeling. Aviation environmental analyses, impact determinations, and mitigation decisions for NextGen activities must continue to be based on a solid scientific foundation. This will require continued investments in research to improve our scientific understanding of the impacts of aviation. This is particularly important with respect to aviation's effects on climate. It is also germane to gaining a more nuanced and multi-faceted understanding of noise impacts, given community concerns with aircraft noise and public pressures to mitigate noise at levels lower than current Federal guidelines. In addition, the development and use of advanced decision-support tools that account for interdependencies of impacts and cost-benefit analyses of potential solutions will facilitate more informed decision-making.

Prospective solutions and combinations of solutions have different impacts, benefits, and costs. Some solutions have the ability to optimize for one area of environmental protection at the expense of another, and trade-offs should be as transparent as possible.

Air Traffic Management Modernization. The development and integration of advanced operational procedures and infrastructure improvements will foster National Airspace System (NAS) operational capabilities that will function more efficiently and contribute to mitigating environmental impacts and improving energy efficiency. NextGen will increase the efficiency of aircraft operations, both in the air and on the airport surface. Improving efficiency saves time and fuel. Reducing fuel consumption reduces CO_2 emissions that affect climate and other emissions that adversely affect air quality. Fuel burn, emissions, and flight times can be cut by Performance Based Navigation (RNAV/RNP) routes. Optimized Profile Descents can reduce noise, emissions, and fuel consumption. NextGen technology and procedures that optimize gate-to-gate operations are being demonstrated with international partners in Europe and Asia-Pacific to reduce fuel burn, emissions, and noise.

New Aircraft Technologies. Historically, new technologies have offered the greatest success in reducing aviation's impacts. New engine/airframe technologies will need to play key roles in achieving aviation environment and energy goals. The U.S. will support advances in engine technology and airframe configurations to lay the foundation for the next generation of aircraft. Our technological strategy envisions a fleet of quieter, cleaner aircraft that operate more efficiently with less energy. The FAA and NASA, along with the Department of Defense, closely coordinate efforts on aeronautics technology research through the President's National Science and Technology Council's multi-agency National Aeronautics Research and Development Plan. Each agency focuses on different elements but they share the same national goals. The FAA's focus is on maturing technologies for near term application, while NASA focuses on a broader range of time frames of technology development. This includes future concepts such as electric aircraft.

Sustainable Alternative Aviation Fuels. Sustainable alternative aviation fuels development and deployment offer prospects for enabling environmental improvements, energy security and economic stability for aviation. The aviation industry has made a commitment to convert its fuel supply to alternative fuels.[15] Government and industry are working cooperatively with coordinating mechanisms such as the Commercial Aviation Alternative Fuels Initiative (CAAFI) and are supporting alternative fuels research. Near term efforts include adding new classes of fuels to the approved alternative jet fuel standard by ASTM International, conducting aircraft flight tests using alternative fuels and ascertaining their emissions characteristics, lifecycle greenhouse gases, and sustainability. A number of challenges remain to sustainable alternative fuel deployment, including financing for commercial production.

Policies, Environmental Standards, and Market-based Measures. Development and implementation of appropriate policies, programs, regulations, and mechanisms are

[15] See 2011The Future of Aviation Advisory Committee (FAAC) Final Report; http://www.dot.gov/faac/environment.html

critical to support advantageous technology and operational innovations and accelerate their integration into the commercial fleet, the airport environment, and entire national aviation system. The NextGen EMS approach will integrate environmental protection objectives into NextGen and facilitate National Environmental Policy Act (NEPA) reviews. Cooperative partnerships between government and industry can focus and leverage funding in ways that are beneficial for aviation and good for the environment. There is a need for continued and enhanced exploration of the most effective means to address residual aircraft noise impacts that cannot be reduced through technologies to guide capital investments in noise mitigation such as sound insulation, to encourage adequate land use planning, and to support other methods. Internationally, the U.S. is leading efforts at the International Civil Aviation Organization (ICAO) to limit and reduce international aviation emissions, including development of a CO_2 standard for aircraft, and a new particulate matter (PM) certification requirement for engines. ICAO has additionally agreed to explore more ambitious goals for the aviation sector, including carbon neutral growth in the mid-term and reductions in the long term. The U.S. is exploring the effectiveness of various policies, including economic incentives to limit and reduce CO_2 emissions. The U.S. is also supporting studies to investigate the need, cost and trade-offs, and the technological feasibility of more stringent noise standards. Additionally, if we are to achieve environmental and energy goals beyond the near term, policies may be needed to accelerate the integration of new technologies into the civil fleet compared to the normal rate of introduction and replacement.

Roles, Responsibilities, and Harmonization

Developing the future air transportation system is a shared responsibility among U.S. government agencies and the aviation industry that involves effective planning, research and development, resource deployment, performance, and collaboration. The Federal government is responsible for national policy and regulations including aircraft noise and emissions, aviation safety, airspace management and air traffic control, research and development, and managing Federal investments in the NAS. Airport proprietors are responsible for managing their airports, including planning and implementing actions to mitigate the adverse effects of airport operations and development on community noise, air quality, and water quality consistent with Federal regulations. Manufacturers of airframes and engines engage in research and development and produce the new technologies that are so critical to reducing the environmental footprint of aviation. Air carriers, air freight operators, and other aircraft operators make product purchase decisions that affect fleetwide environmental performance and fly and service aircraft in ways that affect fuel use and environmental impacts. The use of EMSs by aviation stakeholders contributing to NextGen will play an important role in achieving the environmentally sustainable growth of air transportation.

It is also important to recognize that civil aviation is an inherently global endeavor. We are committed to a sustainable national aviation system that is seamlessly integrated with the larger international system. This will require harmonization with international standards, recommended practices, and guidance through ICAO. This aviation environmental and energy policy statement is intended to be implemented constructively within the larger international system.

Conclusion

Aviation has features that distinguish it from other transportation modes and industries that must be factored into the application of environmental and energy strategies. A high premium on safety demands the incorporation of only proven and technically sound technologies to reduce environmental impacts. Aircraft are high cost and have a long life span, requiring long lead times for new technologies to be widely incorporated in the fleet and close attention to financial feasibility. Airborne systems must be lightweight and fuel-efficient. Airlines and other aircraft operators will need to invest the capital to purchase aircraft with new technologies for aviation to realize the environmental and operational benefits. Airport infrastructure requires substantial planning and construction effort, as well as public and financial support. Noise, air quality, and climate effects of aviation result from an interdependent set of technologies and operations, so that action to reduce impacts in one area (e.g., aircraft engine noise) can increase impacts in another area (e.g., nitrogen oxides emissions). Efforts to protect water quality by reducing deicing fluid discharge could affect safety and efficiency of operations. Such considerations increase the challenge of achieving ambitious environmental and energy goals. Nevertheless, aviation’s impressive record of creativity and innovation can rise to these challenges.

This policy statement is intended to outline strategies and approaches necessary to meet the environmental and energy challenges that confront the U.S. civil aviation system. There is a shared commitment to moving the aviation sector to environmental performance that will reduce aviation's noise, air quality, climate, energy, and water quality impacts notwithstanding the anticipated growth in aviation. Through broad inclusion and sustained commitment among all stakeholders, the U.S. will be a global leader in researching, developing, and implementing technological, operational and policy initiatives that address mobility and environmental needs.

/s/

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